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Research Article

ROLE OF 3 TESLA MRI IN EVALUATION OF ADNEXAL PATHOLOGIES

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ABSTRACT

Characterization of ovarian and non-ovarian adnexal lesions is of great relevance in order to plan adequate therapeutic procedures and influence on patient's management. Optimal assessment of adnexal masses requires a multidisciplinary approach, based on physical examination, laboratory tests and imaging techniques. MRI provides excellent contrast resolution, resulting in accurate tissue characterization and improved anatomic delineation. The quantitative evaluation of the apparent diffusion coefficient (ADC) in DWI helps in distinguishing between malignant and benign tissues and for monitoring therapeutic outcomes. In our study ovarian pathologies (71.4%) were the most common pathologies among which the benign ovarian lesions were the most common in which the most common were endometriotic cyst (38.1%) followed by multilocular ovarian cysts (23.8%). Non Ovarian lesions were only 28.6% among which the most common was hydrosalpinx (27.2%). Malignant ovarian lesions were 30%. Matthews correlation coefficient for both benign and malignant lesions were calculated which was 0.9, which represent perfect prediction between our findings on MRI and follow up.MRI is used to identify the anatomic origin, shape, composition, diffusion restriction and enhancement pattern of the mass, through which a close differential diagnosis, and often a definitive diagnosis can be made.

INTRODUCTION

Pelvic masses in female patients have a broad differential diagnosis, including benign and malignant neoplasms and non-neoplastic diseases. Ovarian cancer accounts for an estimated 239,000 new cases and 152,000 deaths worldwide annually. A woman's lifetime risk of developing ovarian cancer is 1 in 75, and her chance of dying of the disease is 1 in 1004. The disease typically presents at late stage when the 5-year relative survival rate is only 29%. Only few cases which are diagnosed with localized tumour when the 5-year survival rate is 92%. Strikingly, the overall 5-year relative survival rate generally ranges between 30%-40% across the globe.[1] Therefore early diagnosis using appropriate imaging modality and differentiating various adnexal pathologies, their organ of origin is of paramount importance for definitive accurate management.

Many pelvic masses are a diagnostic challenge, given their proximity to a variety of pelvic structures and the overlap of specific imaging features among different diagnoses. Ultrasound is often the first-line imaging modality for the evaluation of pelvic masses, however, ultra-sound may be limited by poor acoustic windows and poor depth of penetration preventing characterization of adnexal pathologies.[2] CT is limited in the pelvis by a lack of soft-tissue contrast.[3]MRI, on the other hand, provides excellent contrast resolution, resulting in accurate tissue characterization and improved anatomic delineation. As a result, MRI has been shown to be more specific and accurate than any other modality for characterizing adnexal masses.[4] In general, 3.0T MR imaging offers a higher signal-to noise ratio (SNR) and higher spectral separation than 1.5T MR imaging. The gain in SNR can be maintained or traded for imaging speed and/or spatial resolution. Compared to 1.5T, potential outcomes of 3.0T imaging include changes in tissue T1 and T2 relaxation times, increased magnetic susceptibility effects, and increased power deposition.[5]

By using a systematic approach to complex pelvic masses, incorporating the patient's clinical and surgical history and using MRI to identify the anatomic origin, shape, composition, diffusion restriction and enhancement pattern of the mass often a definitive diagnosis can be made.[6]

The purpose of the study was to characterise and differentiate the spectrum of various adnexal pathologies on magnetic resonance imaging.

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MATERIALS AND METHODS

This prospective study was done in the Department of Radio-diagnosis of M.G.M. Medical College, Indore, Madhya Pradesh. The study group comprised of 84 patients diagnosed with or with suspicion of gynecological disease with 3 Tesla, Signa GE system using a dedicated pelvic coil. T1, T2, T2 FATSAT, SWI, DWI (Diffusion Weighted Imaging), POST CONTRAST T1 and LAVA FLEX sequences were included in the protocol.

Informed consent was taken prior to the study. Study included patients of all age groups with gynaecological complaints, patients with suspicion of disease on clinical examination, ultrasound or multiphasic contrast enhanced CT. Patients with pelvic floor pathology, prolapse, bowel pathologies, trauma and patients with general contraindication to MRI were not taken up for study.

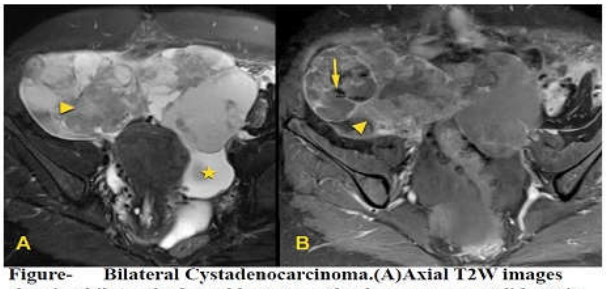

Figure- Bilateral Cystadenocarcinoma.(A)Axial T2W images showing bilateral adnexal large complex heterogenous solid cystic masses with ascites(asterisk) (B) Axial T1 post contrast images showing heterogenous enhancement of the septae and solid components(arrowhead). Small hemorrhages are also seen within the mass(arrow).

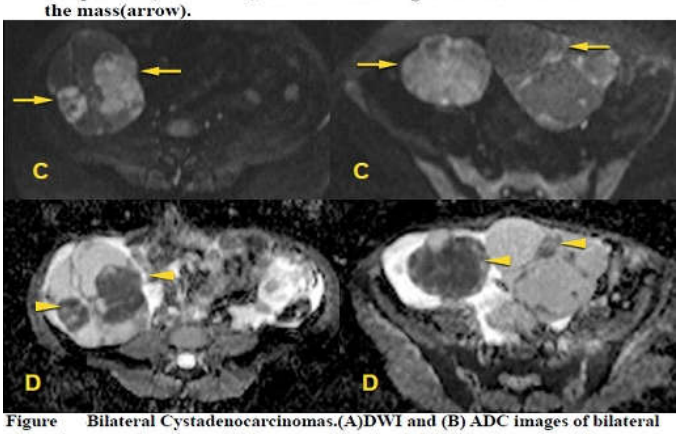

Figure Bilateral Cystadenocarcinomas.(A)DWI and (B) ADC images of bilateral adnexal masses showing multiple areas of restricted diffusion (arrows) with corresponding ADC drop (arrowheads) in the solid components of the masses. This is indicative of densely cellular tissue . Part of the lesions show facilitated diffusion.

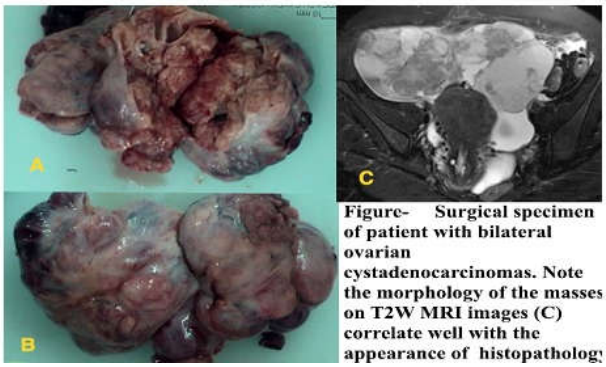

Figure- Surgical specimen of patient with bilateral ovarian cystadenocarcinomas. Note the morphology of the masses on T2W MRI images (C) correlate well with the appearance of histopathology

Figure 1 Predominantly Cystic Malignant Ovarian Tumour

RESULT

Table 1 Adnexal Pathologies on MRI

Ovarian Lesions (71.4%)				Non Ovarian Lesions (28.6%)			
Benign (70%)	% of Cases	Malignant (30%)	% of Cases	Benign (91.7%)	% of Cases	Malignant (8.3%)	% of cases
Simple Cyst	9.5 (4)	Predominantly Cystic	66.6 (6)	Hydrosalpinx	27.2 (6)		
Multilocular Cyst	23.8 (10)	Predominantly Solid	33.3 (3)	Haematosalpinx	18.1 (4)		
Endometriotic Cyst	38.1 (16)			Abscess	9 (2)	Solid appearing	100% (2)
Dermoid Cyst	14.3 (6)			Tubal Ectopic	18.1 (4)		
Polycystic Ovary	9.5 (4)			Myoma	27.2 (6)		
Ovarian Torsion	4.8 (2)						

Ovarian pathologies (71.4%) were the most common pathologies among which the benign ovarian lesions were the most common in which the most common were endometriotic cyst (38.1%) followed by multilocular ovarian cysts (23.8%). Non Ovarian lesions were only 28.6% among which the most common was hydrosalpinx (27.2%). Only 8.3% cases of non-ovarian lesions were malignant while the malignant ovarian lesions were 30% in our study.

Table 2 Accuracy of MRI in diagnosing Adnexal Pathologies

Efficacy Parameter	Benign Lesions	Malignant Lesions
Sensitivity	98.4%	95%
Specificity	95%	98.4%
Positive Predictive Value	98.4%	95%
Negative Predictive Value	95%	98.4%
Accuracy	97.6%	97.6%
Matthews Correlation Coefficient	0.9	0.9

Matthews correlation coefficient for both benign and malignant lesions were calculated which was 0.9, which represent perfect prediction between our findings on MRI and follow up.

Discrepancy between MRI findings and follow up was seen in 2 cases.

DISCUSSION

In the present study, the most common age group encountered was the fifth decade, with mean age of 45 years. The most common presenting complaint was lower abdomen pain seen in 32.5% of the patients in the study followed by lump in abdomen in 28.8% patients.

Of the patients having ovarian lesions 75% were benign. Endometriotic cysts (16 patients) were the most common ovarian benign lesionsen countered in 38 % of the population with ovarian lesions. These were single and multiple thick-walled cystic lesions with surrounding fibrosis and adhesions to adjacent structures appeared hyperintense on T1- weighted images and are typically of low signal intensity on T2-weighted images.6 patients of dermoid cysts revealed high signal intensity both on T1-weighted and T2-weighted images and signal loss on fat suppression sequences.2 cases of ovarian torsion revealed an enlarged edematous ovary with peripheral follicles, twisted pedicle, a subacute ovarian hematoma and abnormal or lack of ovarian enhancement. Ascites, deviation of the uterus to the side of the twist, engorged vessels on the twisted side, and fallopian tube thickening were other associated findings.

There were 24 patients with adnexal lesions (non-ovarian) in our study of which 91.7% were benign. Hydrosalpinx and myomas(27.2% each) were the most frequently seen benign

adnexal pathologies. On MRI, hydrosalpinx appeared as a tubular fluid-filled structure folded on itself to form an S or C shape while myomas were well-defined masses of low signal intensity on T2-weighted images and enhanced after administration of contrast.

All adnexal masses were correctly diagnosed by MRI except for 1 adnexal mass which was misdiagnosed as malignant neoplasm while the histopathological follow up revealed a broad ligament fibroid. This was due to heterogeneity of the mass because of its large size and areas of cystic degeneration.
The most common pattern of enhancement in benign lesions was peripheral enhancement seen in with multiloculated ovarian cysts, endometriomas, hydrosalpinx and hematosalpinx.

Both benign and malignant lesions showed diffusion restriction in our study. Benign lesions that showed restriction of diffusion were endometriomas, hematosalpinx, pelvic abscesses and ovarian torsions. The presence of blood products within hematosalpinx and ovarian torsion was the reason for resticted diffusion within these lesions. All malignancies including ovarian and non-ovarian showed restricted diffusion within the lesion except for 1 patient which was misdiagnosed ascomplex multiloculated ovarian cyst on MRI which on follow up turned out to be predominantly cystic malignant ovarian tumour. This was due to homogeneous T2W signal within the lesion and no restriction on DWI and lack of enhancement.

Malignant ovarian lesions were presented as complex solid cystic lesions which were classified as predominantly solid and predominantly cystic in the basis of larger component of the lesion. Out of 18 ovarian neoplasms 66.6% (12 patients) were predominantly cystic while rest 33.3 % (6 patients) were predominantly solid. The malignant lesions appear heterogeneous and solid component was heterogeneously enhancing while cystic with septations showed enhancing wall and septations. Diffusion restriction was shown by all the malignant lesions except one lesion was misdiagnosed as multiloculated ovarian cyst.

The sensitivity and NPV of the MRI in diagnosing benign adnexal pathologies was turned out to be 98.4% and 95% respectively. The specificity and PPV were 95% and 98.4% respectively while the sensitivity and NPV of the MRI in diagnosing malignant adnexal pathologies was turned out to be 95% and 98.4% respectively. The specificity and PPV were 98.4% and 95% respectively. Discrepancy between MRI findings and follow up was seen in 2 cases.

Matthews correlation coefficient for both benign and malignant lesions were calculated which was 0.9, which represent perfect prediction between our findings on MRI and follow up.

CONCLUSION

An important issue to consider in the management of ovarian masses is that they are very common, but most of them are benign and only a small part is borderline or malignant. Pairing clinical presentation and imaging findings will direct appropriate management.

Through excellent contrast resolution, anatomic delineation, and tissue characterization, diffusion restriction and pattern of contrast enhancement, MRI provides with the tools needed to solve all these questions. Although a definite diagnosis is not always possible, a systematic approach to imaging features and clinical context often provides a close differential diagnosis and often a definitive diagnosis.

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